

REMARKS:

- 1) The Final status of the Office Action of June 28, 2005 is to be withdrawn in view of the accompanying Request for Continued Examination (RCE). The examination shall be continued on the basis of the present amended claims.

- 2) The claims have been amended as follows.

Independent claims 1 and 16 have been amended to further particularly distinguish the invention from the prior art, as will be discussed below. Claims 1 and 16 now expressly recite that the modulation indices represent additional information, and that the modulation signal is evaluated to obtain the additional information in addition to the data or information items conveyed or represented by the information symbols. This feature of the invention is supported in the original disclosure (see page 3 lines 11 to 22, page 4 lines 1 to 12, etc.) and is a generalization of the more-particular example given in claim 23. Thus, the present amendment does not introduce any new matter.

Claim 5 has been editorially clarified.

Claims 7, 13 and 29 have each been amended into independent form by incorporating the subject matter of the prior parent independent claim 1 or 16. This mere claim combination does not introduce any new matter.

Claims 22 and 23 have been amended for proper conformance with the amended independent parent claim 16.

New claim 32 depending from claim 1 has been added, and is based on the subject matter of claim 23. Thus, new claim 32 does not introduce any new matter.

Entry and consideration of the claim amendments and the new claim are respectfully requested.

- 3) Referring to items 4) and 6) of the Office Action Summary, it is noted that claims 4, 6, 8, 9, 11, 12 and 15 were already previously canceled and were thus not pending and not rejected. After the present amendment, claims 1 to 3, 5, 7, 10, 13, 14 and 16 to 32 are pending.
- 4) Referring to item 10) of the Office Action Summary, it is assumed that the revised drawings filed on February 23, 2005 have been accepted.
- 5) Referring to the top of page 3 of the Office Action, the rejection of claim 5 as indefinite has been addressed in the present amendment. Amended claim 5 now avoids the use of undefined variable "x". Withdrawal of the rejection under 35 USC §112(2) is respectfully requested.
- 6) Applicant's remarks and arguments set forth in the prior Response of February 23, 2005 and still applicable now, are incorporated herein by reference and reasserted.
- 7) Moreover, the present amendment of independent claims 1 and 16 expressly recites and clarifies a significant distinguishing

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feature of the present invention. That feature was discussed in the prior Response (for example see pages 19 and 20 of the prior Response) and was inherently or indirectly a feature of the prior claims. That feature has now been expressly and positively recited in claims 1 and 16.

Particularly, claims 1 and 16 now recite that the modulation indices represent additional information in addition to the information items represented by the information symbols. Furthermore, the modulated information signal is evaluated in the second device or transceiver to obtain the information items represented by the information symbols and the additional information represented by the modulation indices.

Thus, it has now been clearly defined in the amended claims, that by assigning different modulation indices to the various information symbols, the respective modulation index itself conveys additional information in addition to the information conveyed by (e.g. encoded by) the information symbols. For example, the respective modulation index can identify the type of data (e.g. a temperature, a pressure, a speed, or the like) that is being conveyed, while the data itself is encoded by the information symbols and represents e.g. a numerical value of the respective identified temperature, pressure, speed, etc.

Therefore, it is not necessary to encode the data type information (i.e. the additional information) using additional information symbols, because the data type information (or any other additional information) is conveyed by and can be obtained from the detected modulation index of the respective information symbol. In other words, rather than transmitting information

only in the encoded data words represented by the information symbols, the present inventive method transmits additional information in a further aspect of the signal, particularly in the modulation indices of the information symbols. This achieves an increase of the total amount of information, i.e. the total data rate, being transmitted.

In this regard, please also see the discussion at pages 19 and 20 of the prior Response.

As will be discussed below, the prior art does not disclose and would not have suggested this significant feature of the present invention.

- 8) Referring to pages 3 to 4 of the Office Action, the rejection of claims 1, 16 to 21 and 28 as obvious over Piirainen (WO99/33237) in view of Hwang et al. (IEEE Journal on Selected Areas in Communications, Vol. 7, No. 9, December 1989, pages 1450 to 1461) is respectfully traversed.

Independent claims 1 and 16 have been amended to more clearly and expressly distinguish the invention over the prior art, as discussed generally above.

As acknowledged by the Examiner, Piirainen does not disclose assigning different modulation indices to respective information symbols. In this regard, the Examiner has turned to the teachings of Hwang et al. But even Hwang et al. does not disclose and would not have suggested assigning different modulation indices respectively to information symbols, wherein the modulation indices represent additional information in addition to information items or data represented or conveyed by

the information symbols. Furthermore, Hwang et al. would not have suggested evaluating a received modulated signal to obtain therefrom both information items represented by the information symbols as well as the additional information represented by the modulation indices.

It is true that Hwang et al. disclose assigning different or varying modulation indices to successive information symbols. However, the modulation indices are cyclically varying and prescribed by a particular function (see page 1450, left column, lines 20 to 25; page 1450, right column, lines 9 to 30; page 1451, left column, paragraph between equations (2) and (3); page 1451, right column, first complete paragraph; page 1451, right column, from equation (5) to bottom of page; etc.). The equations (5), (6), (7) exemplify the cyclically varying assignment of the modulation indices " h_{i-1} " (e.g. $h_a, h_b, h_c, h_a, h_b, h_c, h_a, h_b, h_c, \dots$) respectively to the i^{th} information symbol. This fixed cyclical variation or pattern of the modulation indices is selected so that the proper modulation index is used for decoding each respective information symbol in the receiver station, i.e. in a manner synchronized with the transmitter station (see page 1450, left column, line 20 to right column, line 30; and page 1455, right column).

The purpose and use of the different modulation indices is NOT to convey or represent any additional information, but rather to ensure that respective different information symbol sequences will not overlap or intersect, i.e. and thus become ambiguous, before a desired constraint length " v " of a given number of symbol periods. In this regard, "phase trellis paths" are used

as a representation of the possible paths followed by the process of modulation of any given information symbol sequence. By properly choosing the modulation indices, no pair of phase trellis paths for different symbol sequences will merge before the desired constraint length v (page 1451, right column, first complete paragraph and Figs. 1 and 2). Thereby, improved performance is achieved because the receiver can evaluate a longer reception interval.

Thus, according to Hwang et al., there is no additional information that is decoded and obtained from the modulation indices in the receiver station, because the cyclically varying modulation indices merely ensure that the phase trellis path of a given symbol sequence will not merge with the phase trellis path of a different symbol sequence before the interval defined by the constraint length v . In other words, the modulation indices do not convey any additional information that is evaluated and thereby re-acquired in the receiver station, but instead the modulation indices merely vary cyclically to ensure that a given sequence of a given number of information symbols can be evaluated unambiguously (or at least with a reduced error rate) relative to other information symbol sequences, in the receiver station (page 1451, right column, first complete paragraph). The result is only that the data or information items represented by the information symbols are evaluated and decoded in the receiver station.

Even if the teachings of Hwang et al. regarding a cyclically varying modulation index would have been considered in combination with the teachings of Piirainen (the discussion of

which in applicant's prior Response is incorporated herein by reference), the present invention would not have been suggested. Particularly, there would have been no suggestion from the combined teachings of the references, that the modulation indices convey or represent additional information in addition to the data or information items represented by the information symbols, and that the additional information is obtained from the modulation indices through an evaluation of the modulated signal in the receiving station.

The dependent claims 17 to 21 and 28 are patentable already in view of their dependence from claim 16.

Moreover, as to claim 20, the Examiner's assertion that "different data rate means different durations" is respectfully traversed as inapplicable in the context of present claim 20. The cited portion of the reference refers only to a symbol rate, which is a conceptional construct of the inverse of the length or duration of a single data symbol, but a true "data rate" refers to the overall rate at which data made up of a successive plurality of many information symbols is transmitted. Furthermore, such plural successive information symbols of varying duration could have a constant average or overall data rate. Thus, the variation of an overall data rate does not tell us anything about the particular durations of individual information symbols, and vice versa.

Regarding claim 21, the Examiner's assertion that "Piirainen teaches information symbols having different modulation indexes" does not suggest or relate to the feature of present claim 21, wherein the information symbols respectively have different

numbers and/or patterns of modulation pulses making up the information symbols. The different modulation index does not suggest or require different numbers and/or patterns of modulation pulses.

For the above reasons, the Examiner is respectfully requested to withdraw the rejection of claims 1, 16 to 21 and 28 as obvious over Piirainen in view of Hwang et al.

- 9) Referring to pages 4 to 7 of the Office Action, the obviousness rejections of claims 2, 3, 10, 14, 22 to 27, 30 and 31 applying Piirainen and Hwang et al. further in view of additional cited references are respectively traversed.

All of these rejected claims depend from independent claims 1 or 16, which have been discussed above in comparison to Piirainen and Hwang et al. These dependent claims are patentable already due to their dependence for the above reasons. The asserted disclosures of the additional references relating to particular features of the individual dependent claims would not have provided any further suggestion toward the features of independent claims 1 and 16 as discussed above.

Regarding claims 22 and 23, the admitted prior art merely discloses that different types of information exist and can be represented by the information symbols, and that the different information types must be distinctly encoded digitally using additional information symbols, in conventional methods. That is exactly the disadvantage being overcome by the present invention. For example, in the inventive method, the information

type can be represented by the modulation index while only the information value is represented by the information symbols.

For these reasons, the Examiner is respectfully requested to withdraw the rejections of these dependent claims.

- 10) Referring to the bottom of page 7 of the Office Action, the indication of allowable subject matter in claims 7, 13 and 29 is appreciated. In the present amendment, these claims have been converted into independent form, and should now be allowable.
- 11) It is noted that claim 5 was not subject to a prior art rejection, and the indefiniteness rejection has been overcome as discussed above. Thus, claim 5 should also be seen as defining allowable subject matter.
- 12) Favorable reconsideration and allowance of the application, including all present claims 1 to 3, 5, 7, 10, 13, 14, and 16 to 32, are respectfully requested.

Respectfully submitted,
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Form PTO-2038

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